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Experimental Storage of Florida Oranges at New York City, 1949

By

J. S. Wiant, Senior Pathologist
B. A. Friedman, Assoc. Pathologist
H. W. Hruschka, Asst. Physiologist
Jacob Kaufman, Asst. Pathologist
W. A. Radspinner, Assoc. Horticulturist

Division of Fruit and Vegetable Crops and Diseases

Report of a study made under the
Research and Marketing Act of 1946
Project No. 413

December 1949
New York, New York

Experimental Storage of Florida Oranges at New York City, 1949 1/

This report summarizes results obtained from storage tests with Florida oranges that were made at New York City during the spring and summer months of 1949. These tests were part of a broader investigation on citrus storage conducted under provisions of the Research and Marketing Act of 1946.

Two separate tests were made. The first was concerned with determining the effectiveness of diphenyl in reducing losses from decay. This was set up in the same manner as in 1948, except that the 50° F. temperature used in 1948 was eliminated in 1949. The object of the second test was to determine the effect of ethylene and color-added treatments on storage behavior. The complete history of the fruit for both tests follows:

Variety:	Valencia
Rootstock:	Rough lemon
Grower:	Chase and Company
Location of grove and packing house:	Isleworth, Windermere, Florida.
Picked:	April 21 (test 2) and April 26 (test 1), 1949.
Packed:	April 21 and 22 (test 2) and April 26 and 27 (test 1).
Treatments:	All fruit of both tests was washed with Ravndal Products Inc. No. R.P. 40 soap, and waxed with Food Machinery No. 73 flavorseal wax. Only in certain boxes noted below were borax, ethylene or color-added treatments used. Where used they were: for ethylene - 24 hours at 80° (April 21 to 22, test 2); for color added - Food Machinery No. 14TC color at 122 to 124° F.; for borax - 10 seconds dip in 5 percent solution 16 hours prior to packing.
Car:	Fan car WFEX-66521 (fans sealed in "on" position to destination).
Icing:	Preiced at Sanford; ice one foot from top of bunkers at Isleworth.

1/ Personnel engaged in the work at New York - B. A. Friedman, H. W. Hruschka, J. Kaufman, W. A. Radspinner and James S. Wiant.

Paul L. Harding assumed full responsibility for selecting the fruit and preparing the test packages for shipment to New York.

Special acknowledgment should be made to Mr. Paul B. Christensen and Mr. W. Kinney of the Merchants Refrigerating Company for their cooperation in conducting the tests.

Temperature in car when opened: 51° F.
Time of loading: Test boxes - 2:30 to 3:10 p.m.
Carloading completed 5:30 p.m.
Shipped: April 28, from Isleworth.
Refrigeration: Special refrigeration service, item 80, Section 2, with reicing at Potomac Yards.
Route: ACL, RF&P, PRR.
Consignee: Yaden, Keeler & Young
Unloaded: 4:00 a.m. - May 2.
Placed in storage: 10:00 a.m. - May 2.

Temperature records obtained with a Ryan recording thermometer packed in one box of the ethylene - color-added test showed a gradual drop from about 80° F. at mid-day of April 23 to 50° at time of loading on April 28. Transit temperatures in this box loaded at bottom quarterlength centerline position ranged near 50° during the transit period, although near 47° during the last 24 hours. A Ryan thermometer placed in a box of the diphenyl test and loaded at top quarterlength centerline position recorded a fairly gradual drop from 84° on April 26 to 55° at time of loading on April 28. Transit temperatures ranged between 54° and 59° and averaged about 56°.

There was little increase in temperature of the fruit between the time it was unloaded and the time it was placed in storage. The storage rooms were those used during the 1948 tests and were located in the 17th Street warehouse of the Merchants Refrigeration Company at New York City. The floor dimensions of each room were approximately 8 feet by 18 1/2 feet and the height 11 feet.

Continuous temperature and relative humidity records were made with Friez hygrothermographs. The instruments were checked for accuracy at frequent intervals. One room, hereinafter referred to as the 32° room, was held at 32° to 34° F. and at an average relative humidity of about 89 percent. The other room, hereinafter referred to as the 38° room, ranged between 38° and 40° and had an average relative humidity of about 74 percent.

Methods of procedure and of inspection followed were those agreed upon at the Beltsville conference of January 11, 1949. In scoring the several types of skin breakdown, a given fruit that showed both aging and pitting was scored under the defect that was considered the more serious blemish. Decay was always considered more serious than any type of skin breakdown. Decayed fruit were scored under stem-end rot if the symptoms were characteristic of *Diplodia* rot or *Phomopsis* rot, even though the decay occurred elsewhere than at the stem end. All fruit showing decay at the first inspection (at time of removal from storage) was discarded ; the amount of decay recorded at the second inspection (i.e. after holding the fruit seven days at 70°) is the total amount found at both inspections. Pitting and aging records of the second inspection are not cumulative, but instead are based on non-decayed fruit remaining at that time. It should be noted that decays other than stem-end rots and *Penicillium* rots are not listed by specific types, but are included with total of decay in each instance. Thus in the tables the total of decay may be greater than the sum of decay attributed to stem-end rot and *Penicillium* rot. Liners and wraps that were used in some of the tests were removed and discarded at the time of the first inspection i.e. when the boxes were removed from storage.

Samples of juice for taste, citric acid and soluble solids determinations were taken at the time of the second inspection from a composite sample prepared by juicing twenty-five fruit (150 size) of each lot tested. Duplicate determinations of soluble solids were made with a hand refractometer. The citric acid readings are averages of two determinations on twenty-five milliliters of juice. The methods were identical with those used in similar studies at Orlando, Florida. (See H. T. & S. Office Report No. 219 .)

Test 1 - Comparison of Plain Wraps with Diphenyl Wraps and Diphenyl Liners.

This test was carried out with 42 standard boxes of fruit made up of the following:

A. 14 boxes of oranges that had been treated with borax and individually wrapped with diphenyl-impregnated wrappers.

B. 14 boxes of naked fruit (unwrapped), but with the fruit in each half of the box surrounded with a diphenyl-impregnated ("Phenodor") paper liner.

C. 14 boxes of oranges that were individually wrapped in plain citrus wraps (checks).

Two boxes (one each of 150 and 176 size) of each treatment were brought to the laboratory and inspected immediately. They showed no evidence of aging or pitting and only one decayed orange was found in all six boxes. The wraps and liners were removed and the boxes placed at 70° F. for one week. At the end of that time there was a total of 1.1 percent decay in the diphenyl-wrap lot; 1.4 percent in the diphenyl-liner lot; and 6.0 percent in the check lot. No aging or pitting was noted.

Six of the remaining 12 boxes of each treatment were placed in the 32° F. storage room and the other six in the 38° F. room. Two boxes of each treatment were removed from each room for inspection at the end of 8, 12 and 16 weeks storage respectively. The results are summarized in tables 1, 2 and 3.

Aside from the development of decay there was little effect of storage on the general appearance or condition of the oranges. The fruit remained fairly firm and retained a good fresh appearance throughout the entire sixteen-week storage period. Even after holding for one week at 70° F. following each of the three withdrawals from storage the sound oranges were considered fully salable. There were no significant differences in general appearance of the fruit that could be attributed to the treatments. At most inspections it was observed that those stored at 38° were slightly less firm than those stored at 32°. It will be noted from tables 1, 2 and 3, that loss in weight during storage was slightly greater at the higher temperature. In this connection it should be recalled that a lower relative humidity prevailed in the 38° room than in the 32 room.

It will be seen from tables 1, 2 and 3 that pitting and aging were of only limited importance throughout the test.

The most striking effect of storage was on the development of decay. At the 32° temperature very little decay developed during actual storage, as evidenced by the data taken at the first (or "at removal") inspection. However, after holding the fruit at 70° for one week following its removal from 32° storage, decay increased considerably. This increase was progressively greater with increase in the length of the storage period. Least decay occurred in those lots with diphenyl liners (N) and most in the check lots (P). It should be noted that at the time of removal after 16 weeks storage there was a marked odor of diphenyl in the treated liners and a faint odor of diphenyl in the treated wraps.

Decay in the 38° lots was generally higher than in comparable lots stored at 32°. There was somewhat more decay at time of removal after 12 weeks than after 8 weeks, and more after 16 weeks than after 12 weeks storage. Decay increased greatly during the one week the fruit was held at 70° F., particularly after 12 weeks and 16 weeks of storage. In contrast with the results at 32° there was somewhat more decay in the diphenyl liner lots than in the diphenyl-wrap lots.

Stem-end rot was by far the most important type of decay, with *Penicillium* rots of secondary importance. The chief type of decay included in total of decay, but not specifically named in tables 1, 2 and 3, was *Alternaria* rot which developed in the vicinity of the buttons. It was particularly prevalent in those lots stored for 16 weeks at 32° F.

The relation of treatment and storage temperatures to decay is shown graphically in figure 1. The data plotted are based on total of decay and are shown for the inspections made at time of withdrawal and for those made after one week at 70° F.

A summary of the data on volume of juice per fruit, total solids, total acid and palatability of the juice, is presented in table 3-A. It will be noted that the juice was acceptable in all instances and for the most part was rated as fair in taste. There was little difference between the two temperatures with respect to any juice character. At both temperatures there was a tendency for total acid to decrease and solids-acid ratio to increase during the storage period.

Test 2 - Relation of Color-added and Ethylene Treatments to Storage Behavior.

The test fruit consisted of 56 standard boxes. The fruit in each half of each box was surrounded by a diphenyl-impregnated ("Phenodor") paper liner. The test packages were divided into four lots, representing as many treatments. These were:

A. 14 boxes - checks, not treated with either ethylene or color added.
B. 14 boxes - received color added treatment only.
C. 14 boxes - received ethylene treatment only.
D. 14 boxes - fruit treated with both ethylene and color-added.

Two boxes (one each of 150 and 200 size) of each treatment were brought to the laboratory for immediate inspection. At that time there was no significant amount of aging or pitting in any of the eight boxes. No decay was found in the ethylene plus color-added lot; a trace (0.3 percent) in each of ethylene alone and coloradded alone lots; and 1.0 percent decay in the two check boxes. After one week at 70° F. there was still practically no pitting or aging in any of the four lots. Total of decay at end of the one-week holding period was 3.1 percent for color-added plus ethylene, 4.3 percent for color-added alone, 4.0 percent for ethylene alone and 5.3 percent for checks.

Of the remaining 12 boxes of each treatment six were placed in the 32° storage room and six in the 38° room, from each of which two boxes of each treatment were removed at the end of 8, 12 and 16 weeks storage respectively. The results are summarized in tables 4, 5 and 6.

As in the diphenyl test, there was little effect of storage noted other than the development of decay. The fruit of all treatments at each of the three storage withdrawals was generally fairly firm and had a fairly fresh appearance. It remained much the same after holding for one week at 70° F. Neither aging nor pitting was a factor of much importance during the test. The sound (non-decayed) fruit of all treatments was considered fully salable throughout the entire storage and after-storage holding periods. There was little difference (other than decay) between that stored at 32° and that stored at 38°, although after 16 weeks storage the 32° fruit appeared to be slightly firmer than that held at 38°. It will be noted that weight loss during storage was somewhat greater at the higher temperature but that at neither temperature was degree of weight loss related to treatment.

Throughout the storage period the deepest color was found on the color-added fruit, either with or without ethylene. There was little difference in color of the fruit treated with ethylene alone and the untreated checks.

In the boxes stored at 32° little decay was observed at the first inspection (i.e. at time of removal from storage) even after 16 weeks of storage. However, at the second inspection made after holding the test boxes at 70° for a week, decay was a serious factor even after eight weeks storage and became progressively worse with longer storage. Decay was more prevalent in the boxes stored at 38° than in those at 32°. This was particularly noticeable at the first inspections of the fruit stored for 12 and 16 weeks and at all second inspections.

As in the diphenyl test, stem-end rot was a more important factor than Penicillium rots. Alternaria rot was the chief type of decay that was included under total decay in tables 4, 5 and 6, without being specifically named. It was particularly prevalent at the second inspection of the boxes stored for 16 weeks at 32°.

The relationship of treatment to decay development, although shown in tables 4, 5, and 6, is brought out more clearly in figure 2. There was little difference between treatments at the first inspection of the 32° F. lots. At the second inspection most decay was found in the fruit treated with ethylene. Up to 12 weeks, the least decay occurred in the color-added lot. After 16 weeks in storage the least decay was in the untreated check lot. At the first inspection of the 38° lots, decay was consistently somewhat higher in the untreated check lots. At the second inspection decay was most prevalent in the ethylene lot and for the most part least prevalent in the color-added lot.

A summary of juice characters and palatability is presented in table 7. There appeared to be little correlation between juice characters and treatment applied to the fruit. Also the palatability of juice did not appear to have been affected by any of the treatments.

Table No. 1 - Orange Storage - New York City - 1949
Orange County Fruit - 8 weeks of storage.

		Weight Loss			First Inspection								Second Inspection - 1 week at 70° F. 2/							
					Aging		Pitting			Decay			Aging		Pitting			Decay		
Treatment	Storage Temperature	In Transit	In Storage	Number of Fruit	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots
1/	°F.	%	%		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
D	32°	1.4	1.3	323	2.2	0	2.2	0.9	0	0.3	0.3	0	4.0	3.1	0.3	5.0	0	8.7	8.4	0.3
N	32°	0.9	1.1	326	0.3	0	0.3	0	0	0.6	0	0	0	0	0	0	0.3	4.9	4.0	0.3
P	32°	0.8	1.3	324	0.6	0.6	2.5	0.3	0	0.9	0.9	0	0.6	1.2	0.3	0	0	16.7	16.0	0.6
D	38°	0.1	2.8	325	0.6	0	1.2	0	0	0.6	0.3	0.3	1.2	0.3	1.8	0.3	0	10.8	8.9	1.8
N	38°	0.7	2.3	326	1.2	0	1.5	0	0.3	0.3	0.3	0	0.6	0	0	0	0	19.3	19.0	0
P	38°	0.8	3.1	326	0.6	0	1.5	0	0	0.3	0.3	0	0.6	0.6	0.3	0	0.3	33.1	31.0	0.9

1/ D = Diphenyl wrap, Borax treated.
N = Diphenyl liner - naked fruit.
P = Plain wrap.

2/ Decay data, 2nd inspection, cumulative. Pitting and aging data, 2nd inspection, *not* cumulative.

Table No. 2 -- OrangeStorage - New York City - 1949
Orange County Fruit - 12 weeks of storage.

		Weight Loss			First Inspection								Second Inspection - 1 week at 70° F. 2/							
					Aging		Pitting			Decay			Aging		Pitting			Decay		
Treatment	Storage Temperature	In transit	In storage	Number of Fruit	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots
1/	°F.	%	%		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
D	32°	0.4	1.4	326	1.8	0.6	3.7	2.1	0.6	0	0	0	3.7	3.7	6.7	4.9	1.5	13.8	10.4	3.4
N	32°	0.0	1.1	326	0.3	0	0.6	0	0	0.9	0.9	0	0.9	0.3	1.8	0	0	8.6	6.8	1.8
P	32°	0.8	1.5	326	1.2	0.3	0	0.3	0	0	0	0	0.3	0.3	1.2	0.3	0	17.5	15.6	1.8
D	38°			326	0.3	0.3	2.5	0.6	0	0.9	0.3	0.3	0.9	1.8	0.3	1.5	0	30.4	21.8	7.1
N	38°	0.7	2.8	326	0.9	0.6	0.3	0	0	1.8	0.6	1.2	0.3	0	0.3	0.3	0	34.4	23.6	2.7
P	38°			326	2.5	1.2	0.6	0	0	1.2	1.2	0	0.9	0.3	1.2	0	0	58.9	54.3	2.8

1/
D = Diphenyl wrap; **Borax treated.**
N = Diphenyl liner - naked fruit.
P = Plain wrap.

2/
Decay data, 2nd inspection, cumulative. Pitting and aging data, 2nd inspection, not cumulative.

Table No. 3 – Orange Storage – New York City – 1946
Orange County Fruit – 16 weeks of storage.

		Weight Loss			First Inspection								Second Inspection – 1 week at 70° F. 2/							
					Aging		Pitting			Decay			Aging		Pitting			Decay		
Treatment	Storage Temperature	In transit	In storage	Number of fruit	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots	Slight	Severe	Slight	Moderate	Severe	Total	Stem End rot	Penicillium Rots
1/	°F.	%	%	No.	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
D	32°	0.1	2.7	326	2.5	1.8	1.5	1.9	0.6	0.3	0.3	0	3.7	4.0	3.1	0.6	0	27.0	13.2	5.5
N	32°	0.9	1.6	326	1.2	0.3	0.3	0.3	0	0.3	0	0	0	0.3	0	0	0	12.6	2.8	3.7
P	32°	0.9	2.0	325	1.5	2.1	0.6	0	0	0	0	0	0	2.1	0	0	0	24.8	14.1	4.6
D	38°	0.3	4.4	350	2.0	2.6	0.9	0.6	0	1.4	0.6	0.9	0	1.4	0	0.6	0	40.0	23.1	4.6
N	38°	0.5	3.4	350	1.1	0.3	0	0	0	2.7	2.3	0.3	0	0	0	0	0	43.5	40.6	1.4
P	38°	2.0	4.6	350	1.7	3.4	0	0	0	5.7	3.7	2.0	0.9	0.3	0.3	0	0	65.2	60.9	4.3

1/
D = Diphenyl wrap; Borax treated.
N = Diphenyl liner – naked fruit.
P = Plain wrap.

2/ Decay data, 2nd inspection, cumulative. Pitting and aging data, 2nd inspection, not cumulative.

Table 3-A

Juice characters of Valencia oranges from diphenyl test, New York City, 1940. Based on 25 oranges, (150 size) from diphenyl-liner boxes selected at end of the one-week holding period at 70° F. following removal from storage.

Storage Treatment	Volume of Juice Per Fruit ML.	Weight of fruit that was juice PCT.	Total Solids PCT.	Total Acid PCT.	Solids Acid Ratio	Palatability Rating		
						Flavor Rating	Storage Flavor	Taste
8 Wks. at 32° F.	140	56	11.1	.63	17.6	Acceptable	None	Fair
12 " " 32° F.	118 1/	57	12.5	.64	19.7	"	"	"
16 " " 32° F.	139	56	11.4	.57	20.1	"	Slight	"
8 Wks. at 38° F.	141	57	11.2	.67	16.8	Acceptable	None	Good
12 " " 38° F.	142	57	11.2	.57	19.5	"	Slight	Fair
16 " " 38° F.	133	56	11.6	.57	20.4	"	"	"

1/ Obviously an error occurred in determining the volume of juice for this sample.

Table No. 4 - Orange Storage - New York City - 1949
Orange County Fruit - Color added - Ethylene Test
8 Weeks of Storage.

		Weight Loss			First Inspection									Second Inspection - 1 week at 70° F.[2]							
					Aging		Pitting			Decay			Aging		Pitting			Decay		
Treatment	Storage Temperature	In Transit	In Storage	Number of Fruit	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots
[1]	°F.	%	%		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Ck	32°	1.1	0.9	299	0	0	3.7	0	0	0.3	0	0	0	0	1.3	0	0	6.0	.5.4	0
CA	32°	1.3	1.2	300	0.3	0	0.3	0.3	0	0.7	0.7	0	0	0	1.0	0	0	6.0	6.0	0
ETH	32°	0.9	0.8	300	1.3	0	2.7	0.3	0.3	0.7	0.3	0.3	0.7	0	0.3	0	0	10.0	9.7	0.3
ETH & CA	32°	1.6	0.9	298	0.3	0	3.4	0	0	0	0	0	0.7	0.7	2.0	0.7	0	5.4	4.4	0.7
Ck	38°	1.5	2.2	324	0.3	0.3	1.2	0	0	1.9	0.6	0.3	0	0.3	1.2	0.3	0.3	25.3	23.8	1.5
CA	38°	1.4	2.4	326	0	0.6	1.2	0.6	0	1.2	0.9	0.3	0.3	0	0.3	0	0	16.3	14.7	1.5
ETH	38°	1.5	2.1	325	1.2	0	2.8	0.3	0	0.3	0.3	0	0	0	0.3	0	0	25.6	25.2	0.6
ETH & CA	38°	1.1	2.0	326	0.6	0.6	0.6	0.6	0	0.3	0.3	0	0.9	0.6	0.3	0	0	22.1	22.1	0

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[1] Ck = Check .
CA = Color added only.
ETH= Ethylene only.
ETH & CA = Ethylene and color added.

[2] Decay data, 2nd inspection, cumulative. Pitting and aging data, 2nd inspection, not cumulative.

Table No. 5 - Orange Storage - New York City - 1949
Orange County Fruit - Color Added - Ethylene Test
12 Weeks of Storage.

		Weight Loss			First Inspection								Second Inspection - 1 week at 70° F. 2/							
					Aging		Pitting			Decay			Aging		Pitting			Decay		
Treatment	Storage Temperature	In transit	In storage	Number of Fruit	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots	Slight	Severe	Slight	Moderate	Severe	Total	Stem EndRot	Penicillium Rots
1/	°F.	%	%		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
CK	32°	1.1	1.1	326	1.2	0	0.6	0.3	0.3	0.6	0.3	0	0.3	0	0	0.6	0	12.9	10.7	1.5
CA	32°	1.3	1.3	326	1.5	0.6	0.3	0.3	0	0.6	0.6	0	0.3	0.6	0.6	0	0	8.9	8.0	0.6
ETH	32°	1.0	1.2	326	0.9	0.9	1.5	0.3	0.3	0.9	0.9	0	2.8	0.6	0.6	0	0.3	17.5	15.7	0.6
E&CA	32°	1.1	1.4	326	2.5	0.6	1.2	0.6	0.3	0.3	0.3	0	1.5	0.9	2.8	0.3	0.3	13.2	12.0	1.2
CK	38°	1.1	3.3	326	2.8	0.6	1.2	0	0	4.3	4.3	0	0.3	0.3	1.2	0	0	42.9	40.2	0.9
CA	38°	1.4	2.7	326	0.9	0.6	2.5	1.2	0	1.5	1.2	0.3	0.9	0.3	0.3	0	0	34.0	33.4	0.6
ETH	38°	1.1	2.8	326	0.9	0.3	2.5	0.3	0	1.5	1.2	0.3	1.2	0	0.3	0	0	45.7	44.2	1.5
E&CA	38°	1.1	3.0	325	1.5	0.3	1.8	0.3	0	1.8	1.8	0	0.6	0.6	0.9	0.6	0	37.2	36.8	0

1/
CK = Check.
CA = Color added only.
ETH = Ethylene only.
E&CA.= Ethylene and color added.

2/
Decay data, 2nd inspection, cumulative. Pitting and aging data, 2nd inspection, not cumulative.

Table 6 - Orange Storage - New York City - 1949
Orange County Fruit - Color added - Ethylene Test
16 weeks of storage

		Weight Loss			First Inspection								Second Inspection - 1 week at 70° F. 2/							
					Aging		Pitting			Decay			Aging		Pitting			Decay		
Treatment	STorage Temperature	In transit	In storage	Number of Fruit	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots	Slight	Severe	Slight	Moderate	Severe	Total	Stem End Rot	Penicillium Rots
1/	° F.	%	%	No.	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Ck	32°	1.2	1.5	326	0.9	0.6	0.9	0.3	0.3	0.6	0.6	0	2.4	1.8	0.9	0	0.3	14.4	8.0	2.1
CA	32°	1.4	1.4	326	0.9	0.6	0.6	0.6	0	0.6	0.6	0	1.8	1.5	0	0.3	0.3	25.1	13.8	4.0
ETH	32°	1.0	1.5	326	0	0	0.6	0	0	1.2	0.6	0.6	0.9	0	0.6	0	0	28.6	6.1	12.3
ETH & CA	32°	1.1	1.7	326	1.2	0.3	0.6	0.9	0	2.8	0.3	0.9	1.5	0.3	0	0	0.6	25.8	8.3	2.5
CK	38°	1.1	2.7	326	1.5	0	0.6	0	0	8.6	7.1	0.6	0	0	0	0	0	51.9	48.8	1.8
CA	38°	1.4	4.0	326	1.5	1.2	0.3	0.6	0	4.0	2.8	0.6	0.3	0.6	0	0	0	54.6	45.7	8.3
ETH	38°	1.0	3.4	326	0.9	0.6	0	0	0	4.0	2.8	0.3	0	0	0	0	0	58.6	53.7	3.7
ETH & CA	38°	1.1	3.9	326	0.3	1.2	0.3	0.3	0.3	5.8	4.3	1.5	1.5	0	0	0	0	53.7	49.7	3.7

1/ CK = Check.
CA = Color added only.
ETH = Ethylene only
ETH & CA = Ethylene and color added.

2/ Decay data, 2nd inspection, cumulative.
Pitting and aging data, 2nd inspection, *not* cumulative.

Table 7

Juice characters of Valencia oranges from ethylene-color added test, New York City, 1949. Based on 25 oranges (150 size) selected at end of the one-week holding period at 70° F. following removal from storage.

Storage Treatment 1/	Volume of Juice Per Fruit	Weight of Fruit that was Juice	Total Solids	Total Acid	Solids Acid Ratio	Palatability Rating: Flavor Rating	Palatability Rating: Storage Flavor	Palatability Rating: Taste
	Ml.	Pct.	Pct.	Pct.				
8 Wks. at 32°								
CK	141	57	11.2	.56	20.0	Acceptable	None	Good
CA	143	58	11.5	.61	18.9	"	"	"
ETH	140	59	10.9	.62	17.7	"	"	"
ETH & CA	141	57	10.4	.53	19.8	"	"	Fair
12 Wks. at 32°								
CK	135	57	10.8	.52	20.8	Acceptable	Slight	Fair
CA	140	58	10.7	.59	18.1	"	None	"
ETH	138	56	11.3	.61	18.5	"	"	"
ETH & CA	130	55	10.4	.53	19.8	"	"	Good
16 Wks. at 32°								
CK	132	55	11.4	.55	20.7	Acceptable	Slight	Poor
CA	133	55	11.0	.52	21.2	"	"	Fair
ETH	132	55	11.4	.56	20.5	"	"	"
ETH & CA	131	55	10.9	.54	19.9	"	"	"
8 Wks. at 38°								
CK	144	58	11.5	.61	19.0	Acceptable	None	Good
CA	135	59	11.9	.62	19.1	"	"	Fair
ETH	140	59	11.5	.64	18.1	"	"	Good
ETH & CA	136	57	11.6	.64	18.1	"	"	Good

1/ CK = Check
CA = Color added only
ETH = Ethylene only
ETH & CA = Ethylene and color added

Table 7 (Continued)

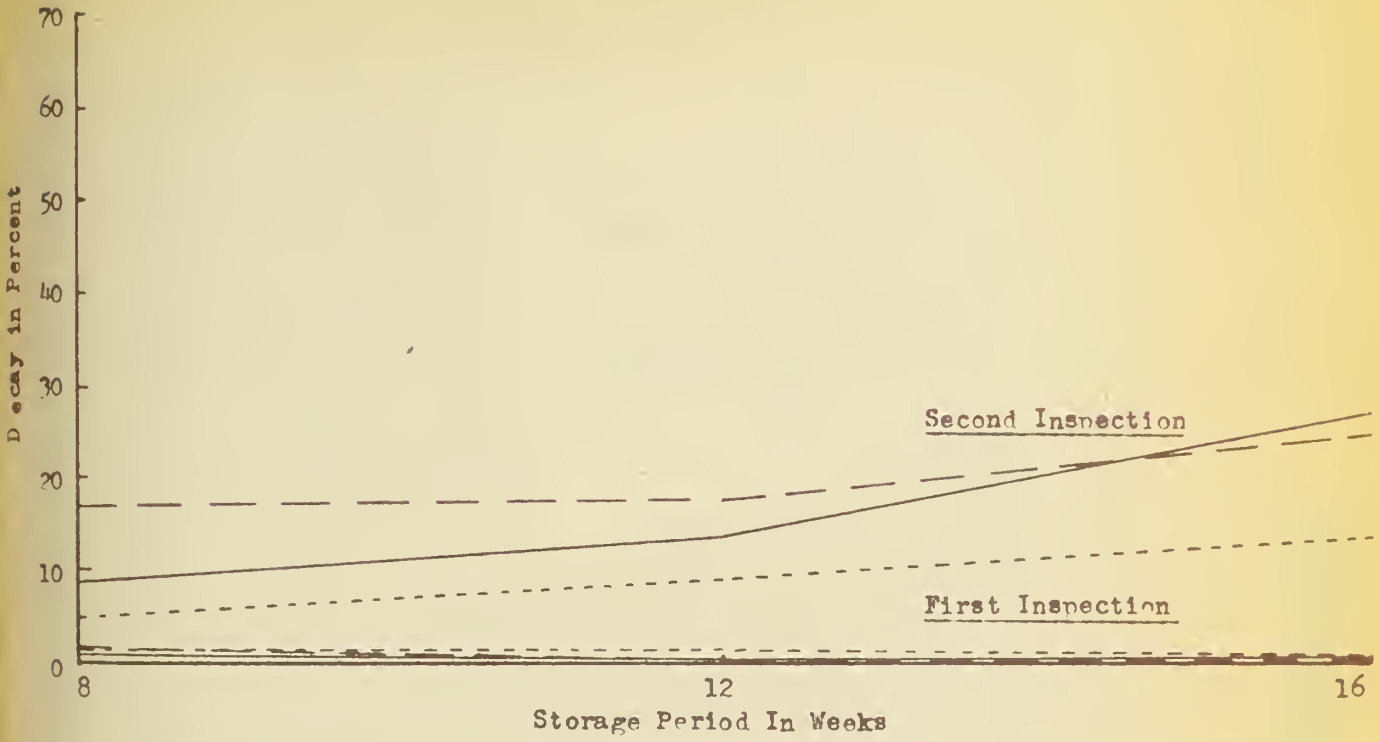
Storage Treatment 1/	Volume of Juice Per Fruit	Weight of Fruit that was Juice	Total Solids	Total Acid	Solids Acid Ratio	Palatability Rating		
						Flavor Rating	Storage Flavor	Taste
	Ml.	Pct.	Pct.	Pct.				
12 Wks at 38°								
CK	135	57	11.0	.51	21.4	Acceptable	Slight	Fair
CA	135	56	10.8	.54	19.9	"	None	"
ETH	141	57	11.0	.56	19.8	"	"	"
ETH & CA	130	55	11.2	.51	21.8	"	"	Good
16 Wks. at 38°								
CK	127	55	11.4	.59	19.3	Acceptable	Slight	Poor
CA	123	54	11.4	.53	21.5	"	"	"
ETH	126	54	11.2	.57	19.7	"	"	Fair
ETH & CA	128	59	11.0	.53	20.7	"	"	"

1/
CK = Check
CA = Color added only
ETH = Ethylene only
ETH & CA = Ethylene and color added

Figure 1. Summary of total decay in diphenyl test.

Legend:
——— (D) Diphenyl Wraps
- - - - (N) Diphenyl Liner
— — (P) Checks

32° Storage



38° Storage

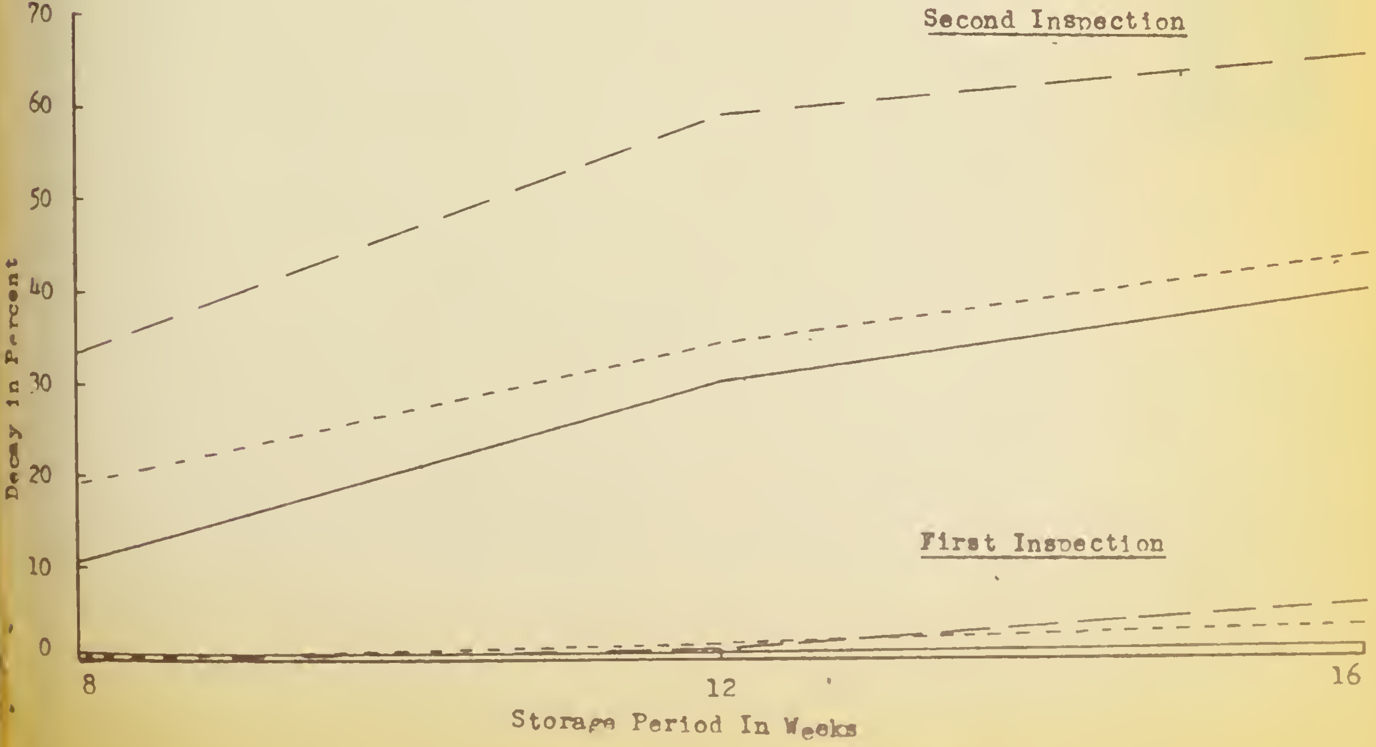


Figure 2. Summary of total decay in ethylene-color added test.